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leaves: the *globose or ovoid spikelets 4 to 8 mm. long: perigynia* 2.5 to 3.5 mm. long, 1.2 to 1.7 mm. broad, *brown tinged,* mostly exceeding the *ovate blunt scales.* — Ehrh. in L. f. Suppl. 414; Wahlenb. Kongl. Vet. Acad. Handl. xxiv. 146, & Fl. Lapp. 230; Schkuhr, Riedgr. 51, t. Ii, fig. 97; Hoppe & Sturm, Car. Germ. t. 6; Hook. Fl. Bor.-Am. ii. 214; Reichenb. Ic. Fl. Germ. viii. t. 204, fig. 542; Anders. Cyp. Scand. 62, t. 4, fig. 30; Boott, Ill. iv. 152, t. 489; Fl. Dan. Suppl. t. 31; Bailey, Proc. Am. Acad. xxii. 145; Macoun, l. c. 127; Britton, l. c. 352, fig. 852. *C. leporina,* Schkuhr, Riedgr. Nacht. t. Fff, fig. 129, not L. *C. Carltonia,* Dewey, Am. Jour. Sci. xxvii. 238, t. U. fig. 64; Torr. l. c. 393. *C. marina,* Dewey, l. c. xxix. 247, t. X, fig. 74; Torr. l. c. — Bogs and mossy places, arctic and alpine EUROPE. Very locally in America: examined from the following stations: — KEEWATIN, York Factory (*Sir John Richardson*): SASKATCHEWAN, Norway House and Carlton House (*Richardson*): ALBERTA, Lake Louise (*Ezra Brainerd,* no. 172): BRITISH COLUMBIA, Glacier (*Ezra Brainerd*); Kicking Horse Lake (*J. Macoun,* hb. Geol. Surv. Can. nos. 28; 49; 30,410; 30,411; 30,412). July, Aug.

II. — THE VARIATIONS OF SOME BOREAL CARICES.

CAREX AQUATILIS.

C. AQUATILIS, Wahlenb., Kongl. Acad. Handl. xxiv. 165. — Plants 3 to 9 dm. high; leaves 4 to 7 mm. broad: spikelets[1] slender; the pistillate 1.5 to 5.5 cm. long, 3 to 4.5 mm. thick, the lowermost often long-attenuated and remotely flowered at base: scales dark, subacute, hardly equalling or barely exceeding the perigynia. — Northern EUROPE, GREENLAND. In North America from the Shickshock Mts., Gaspé, QUEBEC, to Bear Lake, MACKENZIE & BRITISH COLUMBIA, south to MAINE, VERMONT, central and western NEW YORK, and UTAH. The Scandinavian material examined has been referred to the true *C. aquatilis* by Andersson, Fries, Laestadius, and Wickström, and it agrees well with Lange's representation of the plant in Flora Danica, Supplement, t. 33. This is the plant of broadest range in America. Many extreme variations have been described by European authors. The identity of these is too often obscure, but some of the forms recognized by Mr. Arthur Bennett in Great Britain (Jour. Bot. xxxv. 248) are found to occur also in America. As extreme variations these plants may well be distinguished, though many transitional specimens occur which render their ready separation difficult. The best marked forms are the following:

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[1] The inflorescences of *Carex* are simple or compound spikes, racemes, or panicles; and, since in other genera of *Cyperaceae,* as *Cyperus* and *Scirpus,* the ultimate spicate divisions of the inflorescence are called *spikelets,* that term is here adopted, for the sake of uniformity and clearness, for these ultimate spicate divisions of the inflorescence of *Carex.* The species in which there is a solitary simple inflorescence (or true spike), as *C. gynocrates* and *C. exilis,* are few in comparison with those in which the inflorescence has more than one such division. From the occurrence in those plants, however, of occasional secondary divisions of the inflorescence, the term *spikelet* seems not inappropriate to the normal inflorescence of such species.

Var. ELATIOR, Bab. Man. Brit. Bot. 341; Bennett, l. c. 249. — Robust, 0.9 to 1.5 m. high: leaves 5 to 8 mm. broad: pistillate spikelets stout and heavy, 3.5 to 8 cm. long, 5 to 8 mm. thick: scales dark, blunt or acuminate, about equalling or slightly exceeding the perigynia. — MAINE, Fort Fairfield and Orono (*M. L. Fernald*, nos. 136, in part, 395): NEW YORK, Pen Yan & Junius (*Sartwell*); Dexter (*G. Vasey*); Jefferson Co. (*Crawe*); Niagara Falls (*W. Boott*): OHIO (*Sullivant*): MICHIGAN, Pêche Isle, Detroit River (*C. F. Wheeler*): MANITOBA, English River (*Sir John Richardson*).[1] I have been unable to see authentic specimens of Babington's plant, but from his description and the note of Mr. Bennett, it seems probable that our large form should be referred there. The material from Orono (where the once abundant plant has been exterminated by the "improvement" of the meadow) has been described as a hybrid, *C. aquatilis* × *stricta*, Bailey, Bot. Gaz. xvii. 153; but there was little besides the local occurrence of the plant to suggest hybrid origin. The same very large form is shown in Crawe's New York material, as well as in Richardson's English River plant, and it is closely matched by Boott's plate 542, drawn from New York specimens.

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[1] Richardson's plant probably came from the river rising in Lake Sal and flowing into Lake Winnipeg from the southeast. The name *English River* has been applied to a district between the Saskatchewan and Athabasca Lake, and it was long used for the upper portion of Churchill River (emptying into Hudson Bay). This larger northern river, however, was consistently spoken of by Richardson in his Arctic Searching Expedition (1852), p. 62, &c., as Missinippi or Churchill River, while to the more southern river flowing from Lake Sal he applied the name English River (p. 362).

Var. VIRESCENS, Anders. Cyp. Scand. 46; Bennett, l. c. — Scales pale and short, mostly hidden by the closely imbricated perigynia, thus giving the spikelets a pale green color. — Northern EUROPE. The only American specimens seen are from MICHIGAN, without locality (*Michigan State Collection* in herb. Gray); near Alma (*C. A. Davis*). Material from Pownal, VERMONT, closely approaches this variety, but has longer darker scales.

Var. CUSPIDATA, Laest. ex Fries, Bot. Not. (1843) 104; Bennett, l. c. — Spikelets slender, 3 or 4 mm. thick: scales cuspidate, distinctly exceeding the perigynia. — Northern EUROPE. QUEBEC, Grand Etang, Gaspé (*J. Macoun*): NEW JERSEY, Camden (*C. F. Parker*). The Gaspé plant is a perfect match for Lapland material from Nylander, but the New Jersey specimen shows a nearer approach to typical *C. aquatilis.*

Var. EPIGEJOS, Laest. Kongl. Vet. Akad. Handl. (1822) 339; Bennett, l. c. — Very slender: the leaves 2 to 3.5 mm. broad: spikelets at most 5 cm. long, 2 to 4.5 mm. thick; scales dark and blunt. — Northern EUROPE, GREENLAND. NEWFOUNDLAND (*La Pylaie*); Packs Harbor (*A. C. Waghorne*, no. 35): LABRADOR, L'Anse au Loup (*J. A. Allen*): QUEBEC, Mont Louis, Cape Rosier, and Madaline River, Gaspé (*J. Macoun*, nos. 23, 27, 31). The material examined matches well Scandinavian material from Ahlberg. It is also identical with plants from Lapland distributed by Andersson as var. *sphagnophila.* The latter variety, however, is said by Andersson to differ from var. *epigejos* in its pale not dark scales.

CAREX PILULIFERA and C. COMMUNIS.

Carex pilulifera, L., a common species of Europe, presents three rather marked tendencies. The original plant of Linnaeus was apparently the common form with the pistillate spikelets subapproximate or slightly remote at the tip of the somewhat curved culm. This form with the lower spikelets sometimes 1 cm. apart, is represented in the Gray Herbarium by specimens from many parts of northern and central Europe. In this plant the perigynium is 2.5 to 3.5 mm. long, tipped by a short bidentate beak less than 1 mm. in length. Another phase of the plant, evidently rare in Europe, has larger more scattered spikelets, the lower often subtended by a conspicuous leafy bract; and the larger perigynia more ellipsoid or with the longer beak equalling the stipitate spongy basal portion and thus giving the perigynia a symmetrical spindle-form. This larger plant was described by Lange as var. *longibracteata* and later figured by him in Flora Danica, xvii. t. 3050; and again it has been described by Ridley and figured in Jour. Bot. xix. 97, t. 218, as var. *Leesii*. A third European form, var. *pallida*, Peterm., as shown by Reichb. Ic. Fl. Germ. viii. 26, t. 240, has the densely flowered spikelets closely approximate in an ovoid or subglobose head.

In studying this European species in connection with the well known American plant which has recently been called *C. communis*, Bailey, the writer has been baffled in every attempt to find constant distinguishing characters to separate the plants of the two continents. The form of the plant most common perhaps in America is apparently rare in Europe (var. *longibracteata*, Lange; var. *Leesii*, Ridley), but it passes by absolutely promiscuous variations into a small form which can be distinguished in none of its characters from the smaller tendency of the European *C. pilulifera.*

By early caricologists the American plant was supposed to be *Carex varia*, Muhl., and under that name it passed until in 1889 Professor Bailey showed that Muhlenberg's plant was the more slender species described by Dewey as *C. Emmonsii*. In place of the misapplied name, *C. varia*, Professor Bailey proposed for the plant which had long borne that name the new appellation *C. communis*, giving no suggestion that the plant has close affinity to the common *C. pilulifera* of Europe. To earlier students, however, the separation of the American and European plants of this group had presented many perplexities. Drejer stated in his Revisio that he could find no distinctions either in the descriptions or specimens: "Forsitan nostra planta rectius cum *C. varia* Mühlenb. conjungitur; quo modo autem *C. variam* a *C. pilulifera* distinguam, neque ex descriptione neque ex speciminibus eruere possum."[1] Schlechtendahl discussing specimens in the Willdenow herbarium which he took for *C. varia* was unable to point out any character to separate it from *C. pilulifera*: "Species haec vero simillima *C. pululiferae* et uti nobis fere videtur eadem."[2] Whether Drejer and Schlechtendahl had true *C. varia* of Muhlenberg or the coarser plant which so long passed under that name is not perfectly clear, although it is probable that Schlechtendahl at least had the true *C. varia.*[3] This plant, the true *C. varia* (*C. Emmonsii*, Dewey) is readily distinguished from *C. pilulifera* by its much more slender habit, very narrow leaves and smaller-bodied longer-beaked perigynia.

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[1] Drejer, Rev. Crit., 55.

[2] Linnaea, X. 262.

[3] See Bailey, Mem. Torr. Club., I. 40.

The coarse American plant, *C. communis*, Bailey, which until recently passed as *C. varia*, presents, however, less definite marks of specific distinctness. The most careful analysis of the characters which are supposed to separate *C. communis* (*C. varia* of authors) from *C. pilulifera* was published by Francis Boott, who inclined to regard the two species as separable. In his discussion of *C. pilulifera*, Boott said: "A *C. varia*, Muhl. [*C. communis*, Bailey], differt spicis confertis, plurifloris, subinde apice masculis, e viridi-purpureo variegatis; perigyniis enerviis, rostello semper recto breviore bidentato; basi styli persistente abrupte compresso-deflexa; culmo incurvo, basi vaginis foliorum pallide ferrugineis tecto; foliis viridibus."[1] In discussing *C. varia* [*C. communis*, Bailey] he said: "A *C. pilulifera* differt inflorescentia laxa; spicis plus minus remotis, laxifloris, saepe paucifloris; perigyniis subinde nervatis, rostro nunc excurvato, bifido; basi styli persistente recta; vaginis foliorum purpureis."[2]

When we analyze these supposed differences in the light of old specimens and the abundant modern ones which have accumulated since the publication of Dr. Boott's work, certain traditional marks of separation fail. The large form of the American plant figured by Boott (t. 288) as *C. varia*, and treated by Bailey as *C. communis* and by Britton as *C. pedicellata*, has the spikelets more remote than in the common European form of *C. pilulifera*; but a comparison of this plate with Lange's illustration of his *C. pilulifera*, var. *longibracteata* (Fl. Dan. xvii. t. 3050) and the figure of *C. pilulifera*, var. *Leesii* (Jour. Bot. xix. t. 218), shows that the rarest form of the European plant is not to be distinguished by the crowding of the spikelets from our larger form of C. *communis*. If, furthermore, we compare Boott's *C. varia*, var. *minor* (t. 289), a common plant in America, with the smaller European specimens of *C. pilulifera* with slightly remote spikelets, no constant difference can be found to separate them. The plant in America passes by innumerable transitions to the coarsest form (var. *longibracteata*), as shown in the large middle specimen in Boott's t. 289, but in its extreme form, as shown by the smaller specimens in that plate, the spikelets are often subapproximate. A comparison of this plate as well as scores of American specimens such as Eggleston's no. 434 from Middlebury, Vermont; Brainerd's material from Mt. Mosalamoo, Vermont; no. 4897b of the Biltmore Exsiccatae from Craggy Mt., North Carolina; Bailey's material of June 13, 1888, from West Harrisville, Michigan, and his no. 187 from Lansing;

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[1] Ill., II. 96.

[2] Ibid. 98.

Wheeler's specimens from Grand Ledge, Michigan; Macoun's 1876 material from Quesnelie, British Columbia, with specimens of *C. pilulifera* from Berne, Switzerland (*Seringe*); Stockholm, Sweden (*Andersson*); Finland (*Simming*); the Grosser Pfalzberg, Austria (*Halácsy*, no. 1064), and St. Petersburg, Russia (*Turczaninow*); shows conclusively that the remoteness of the spikelets is not to be relied upon in separating our smaller American material from the European plant. In the accompanying tabulation of measurements from European specimens and the smaller form of the American plant it will be seen that in the length of the inflorescence and the number, length and remoteness of spikelets essentially identical conditions are found, although the European material shows a tendency to a reduction in the length of the rachis between spikelets, thus passing to the short-headed var. *pallida*, while the American plant varying toward the elongated variety *longibracteata* shows a natural lengthening of the rachis.

Dr. Boott laid stress upon the more abundantly flowered spikelets of *C. pilulifera*, but an examination of the European material shows that this character is maintained only in the extreme specimens with unusually full spikelets. In the others many spikelets are found bearing less than ten flowers while not a few have only four or five. The presence or absence, in the American or the European plant, of staminate flowers at the tips of the pistillate spikelets is likewise a character upon which little reliance can be placed. Both Goodenough[1] and Dr. Boott[2] noted this tendency in European specimens and in a sheet of Austrian material it is very conspicuous. In America likewise this tendency to androgynous spikelets occurs, but it seems to be quite as unusual as in Europe.

The pale or castaneous scales of *Carex communis* were emphasized by Dr. Boott as opposed to the purple scales of *C. pilulifera*. Students of American Carices, however, are all familiar with specimens of *C. communis* from sunny or open situations in which the scales are quite as purple (or rather maroon) as in *C. pennsylvanica;* and many specimens of European *C. pilulifera* show quite as little color in the scales as do the commoner plants of America.

The basal nerves supposed to distinguish the perigynium of *C. communis* from that of *C. pilulifera* are also quite as often wanting as present; and although Dr. Boott laid stress upon this character in his comparative note, he described the perigynia of *C. communis* (his *C. varia*) as "enerviis vel basi plus minus nervatis pallidis." The length,

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[1] Trans. Linn. Soc., II. 191.

[2] Ill., II. 96.

TABLE OF MEASUREMENTS OF EUROPEAN *Carex pilulifera* AND THE SMALLER FORM OF AMERICAN *C. communis.*

European Specimen.	Collector.	Length of Inflorescence in mm.	Length of staminate Spikelet in mm.	Number of pistillate Spikelets.	Length of pistillate Spikelet in mm.	Distance in mm. between lowest Spikelets.	Length of Perigynia in mm.	Length of Beak in mm.
Strömbacka, Sweden . .	Laurén	12–18	6–8	2–3	4.5–6	4.5–7	3.4	0.6
Finland	Simming	16–19	6–7	3–4	4	8	2.8	0.8
Stockholm, Sweden . .	Andersson	17–22	10–11	2–3	7	5–7	2.7	0.7
Halifax, England . . .	Leyland	13–22	7–10	2–3	5.5	5–10	3.0	0.7
Dresden, Germany . . .		20	9–13	3	4–6	7.5	2.9	0.7
Halle, Germany	A. Schulz	18–23	8–9	4	4–8.5	9	3.0	0.8
Berne, Switzerland . .	Seringe, no. 1238	17–22	10	2–3	4.5–7	3.5–7	3.0	0.8
Upsala, Sweden	Angström	14–26	9–16	2–4	5–9	3–9	2.8	0.7
Kyffhauser (Mt.), Germ'ny		17–22	11	3	6–8	6	3.0	0.7
Grosser Pfalzberg, Austria	Halácsy, no. 1064	14–26	7–18	1–3	3–6	3.5–6.5	2.7	0.9
Salzburg, Austria . . .	Hoppe	26–32	11–13	4–5	6–11	6–9	3.0	0.7
St. Petersburg, Russia .	Turczaninow	18–23	9–11	2	5–7	6–9	2.9	0.7
Upsala, Sweden	Tuckerman	25	10	4	6–8	9	3.0	0.8
Snowdon, Wales . . .	J. Ball	18	6.5	3	6	6	2.9	0.8
Extremes in Europe . .		12–32	6–18	1–5	3–11	3–10	2.7–3.4	0.6–0.9
American Specimen.								
Keweenaw Co., Mich. . .	Farwell, no. 653	10–13	4	2–3	4	5–6	3.3	0.8
Alcona Co., Mich. . . .	Bailey	15–19	4–8	2	5–7	7–15	3.2	0.8
Burlington, Vt.	Jones & Eggleston	11–23	6–13	1–2	6–8.5	7–8	3.2	0.8
Quesnelle, Brit. Columbia	Macoun	15–23	9–10	2–3	5–6	5–10	3.0	0.7
Grand Ledge, Mich. . .	Wheeler	18–19	8	3	5–6	6–9	3.3	0.8
Mt. Mosalamoo, Vt. . .	Brainerd	17–23	8	3	4–6	7–12	2.4	0.8
East Mt., Middlebury, Vt.	Eggleston, no. 434	17–24	9–11	2–3	5–6.5	5–13	2.6	0.9
Willoughby Mt., Vt. . .	Faxon	13–26	6.5–10	1–2	4–6	8–12	3.0	0.7
Lake Memphremagog, Q'b.	Faxon	13–29	3.5–9.5	2–4	4–8.5	7–11	3.0	0.9
Craggy Mt., No. Carolina	Biltmore Herb., no. 4897^b	21–31	9–16	2–3	4–8	7–11	2.8	0.7
Orono, Me.	Fernald	23–36	6–13	3–4	4–9	11–12	3.1	1.0
Franconia, N. H. . . .	Faxon	24–39	8–11	3–4	4–9	7–15	3.3	0.8
Milwaukee, Wis. . . .	Lapham	30–35	14	3	4–7	9	3.0	0.9
Lansing, Mich.	Bailey, no. 187	25–39	13–18	2	4–8	11–14	3.2	0.8
Extremes in America . .		10–39	3.5–18	1–4	4–9	5–15	2.4–3.3	0.7–1.0

bending, and orifice of the beak show likewise considerable variation in Old World specimens, all of which can be matched by our plant, while the curving of the base of the style is a tendency not infrequent in American as well as European specimens. On the other hand, the straight style supposed to characterize the American plant is clearly represented by Lange in his plate of *C. pilulifera*, var. *longibracteata.*

The deeper purple coloring of the lower sheaths of the American plant, a character much emphasized by authors, is not a satisfactory distinction. The color in the American plant is usually conspicuous and is pronounced by Mr. F. Schuyler Mathews a dilute maroon with no true purple tendency, but rather fading in the older sheaths to chestnut. Mr. Mathews, who has likewise examined the sheaths of European specimens, finds the same red present in them. This color of the sheaths generally fades with age, yet in specimens collected by John Ball on Snowdon, by Andersson at Stockholm in 1860, by Laurén at Strömbacka in 1855, and by Tuckerman at Upsala in 1841 or 1842, show quite as conspicuous a red as the average American plant.

The bright green color of the leaves of *C. pilulifera* has likewise been maintained as a character separating that plant from the American *C. communis.* From dried specimens alone it is impossible to make this distinction apparent, although the fresh plant may sometimes show a brighter color than is often seen in *C. communis.* Yet in the American plant the leaves vary from a weak to a deep green, and in Bailey's var. *Wheeleri,* which is certainly inseparable from European specimens of *C. pilulifera,* the leaves were originally described as "bright green."

The length of the staminate spikelet and the breadth of the leaves, two characters upon which stress is sometimes laid, were not emphasized by Dr. Boott. An examination of the accompanying table of measurements of the inflorescence will show that the length of the staminate spikelets is thoroughly inconstant and not concomitant with other characters. In fact, both short and long staminate spikelets are often found on the same individual, as shown by Halácsy's no. 1064 of the Austro-Hungarian Exsiccatae (staminate spikelets from 7 to 18 mm. long), by Fernald's no. 151 from Maine (spikelets 6 to 13 mm. long), and a Faxon plant from Franconia, New Hampshire (spikelets from 8 to 14 mm. long). The variations in the breadth of the leaf, likewise, are very great on both continents. The young leaves at the fruiting season are naturally much narrower than the old and weather-beaten ones, which, unfortunately, are too often torn away in the preparation of attractive specimens. Measurement of the breadth of these older leaves where present shows in the American plant a variation from 2 to 5.5 mm. and in the European from 2 to 4.5 mm. These measurements, however, include the largest American form, in which all the parts are conspicuously more developed than in the smaller American and the apparently identical European plant.

The length of the lower bract, emphasized in the descriptions of *C. pilulifera*, var. *longibracteata* and var. *Leesii*, seems to the writer an unfortunate character to make prominent. In America, at least, this elongation of the bract accompanies no other definable character. It is a purely vegetative development which may occur either in the large form (*C. varia* [typical] of Boott's Ill. t. 288) or in the smaller *C. communis*, var. *Wheeleri* with shorter inflorescence and more approximate spikelets.

This study of the European *Carex pilulifera* and the American *C. communis* (*C. varia* of many authors) has led to the following conclusions. The form of *C. pilulifera* of Europe with the pistillate spikelets subapproximate or slightly remote, the lowest from 0.5 to 1 cm. apart, is also common in America, where the plant has passed generally as *C. varia*, var. *minor*, Boott; *C. communis*, Bailey, and *C. pedicellata*, Britton, in part; or *C. communis*, var. *Wheeleri*, Bailey (*C. pedicellata*, var. *Wheeleri*, Britton). Another European form, the large *C. pilulifera*, var. *longibracteata*, Lange, is rare in Europe, but in America is represented by the large extreme which has passed as *C. varia* and later as *C. communis* and *C. pedicellata*. The American plants, then, should be called

C. PILULIFERA, L. Culms 1 to 5 dm. high, usually overtopping the leaves: inflorescence 1 to 3.5 cm. long, the lowest spikelet subtended by a short and narrow or sometimes elongated broad bract: staminate spikelet from green to chestnut-brown or maroon, sessile or stalked, 3.5 to 20 mm. long; pistillate spikelets 1 to 5, loosely flowered, 4 to 11 mm. long, sessile or short-pedicelled, subapproximate or slightly remote, the lowest rarely 1.5 cm. apart: perigynia hairy, obscurely 3-angled, 2.5 to 3.5 mm. long, the body plump, obovoid or subglobose, with a more or less elongated spongy nerveless or slightly nerved stipitate base; the beak broad, bidentate, rarely 1 mm. long, nearly or quite equalled by the green brown or reddish-brown ovate acuminate scale. — Sp. 976; Gooden. Trans. Linn. Soc. ii. 190; Schk. Riedgr. 78, t. I, fig. 39; Andersson, Cyp. Scand. 30, t. 7, fig. 82; Reichb. Ic. Fl. Germ. viii. t. 260; Boott, Ill. ii. 96, t. 283. *C. filiformis*, Pol. Pl. Palat. ii. 581; Vahl, Fl. Dan. vi. t. 1048; not L. *C. Bastardi*-

ana, DC. Fl. Fr. vi. 293. *C. varia*, Authors, incl. Boott, Ill. l. c. 97, in part, not Muhl. *C. varia*, var. *pedicellata*, Dewey, Am. Jour. Sci. xi. 163, in part. *C. varia*, var. *minor*, Boott, l. c. t. 289. *C. communis*, in part, and var. *Wheeleri*, Bailey, Mem. Torr. Cl. i. 41. *C. pedicellata*, in part, and var. *Wheeleri*, Britton, Mem. Torr. Cl. v. 87, 88. — In dry soil, NEW BRUNSWICK to BRITISH COLUMBIA, NORTH CAROLINA, OHIO and WISCONSIN: common in EUROPE. Passing gradually to

Var. LONGIBRACTEATA, Lange. Coarser; the inflorescence often 5 to 8 cm. long, the usually fuller and longer pistillate spikelets remote, the lowest 1.5 to 4 cm. apart: perigynia larger, more ellipsoid or spindle-form, with longer beak. — Haandb. Dansk. Fl. 621, & Fl. Dan. xvii. 12, t. 3050; Kneucker, Allgem. Bot. Zeitschr. (1898) 128. *C. varia,* Authors, in part, incl. Boott, l. c. t. 288, not Muhl. *C. varia*, var. *pedicellata*, Dewey, l. c., in part. *C. saxumbra,* F. A. Lees, Jour. Bot. xix. 25. *C. pilulifera*, var. *Leesii,* Ridley, Jour. Bot. xix. 98, t. 218. *C. communis,* Bailey, l. c. in part. *C. pedicellata,* Britton, l. c. in part. — NEW BRUNSWICK to IOWA and GEORGIA: rare and local in northern EUROPE.

CAREX PENNSYLVANICA.

Carex pennsylvanica, Lam., is one of the widest-distributed of the North American Carices, and as one of the earliest-flowering it is perhaps better known to the general botanist than any of the other species. In the length and breadth of its leaves, the comparative height of its culm, etc., the plant shows considerable variation, and many formal varieties have been based upon these characters. But since they are all of a purely vegetative nature, often produced in a colony of the species by changes of ecological conditions, none of these variations seem to the writer of sufficient constancy to merit recognition as more than trivial forms. The color of the spikelets, also, a character too commonly relied upon to separate *C. pennsylvanica* from the closely related *C. pilulifera*, L. (*C. communis*, Bailey), is not to be accepted as final, since *C. pennsylvanica,* ordinarily characterized by dark reddish brown scales, may often have them pale or even straw-colored when growing in deep shade. Furthermore, *C. pilulifera* in northern Europe as well as in America is frequently found with dark red scales, especially when growing in very sunny or exposed situations. The simplest means of distinguishing *C. pennsylvanica* from its nearest common ally is in its stoloniferous character; for when well developed the plant produces conspicuous elongated stolons, while *C. pilulifera* (*C. communis*) is caespitose, with short assurgent basal shoots. As may be implied, varieties of *C. pennsylvanica* based upon color of the spikelets are quite as inconstant as are those based upon the length or breadth of the leaf, or other purely vegetative tendencies. In the character of its perigynia, however, *C. pennsylvanica* presents three marked variations which, from the material examined, seem to belong to well marked geographic areas. These forms of the plant are:

C. PENNSYLVANICA, Lam. Dict. iii. 388. Strongly stoloniferous; the slightly caespitose small stools with reddish bases: leaves soft, comparatively narrow, 1.5 to 3.5 mm. broad, 0.5 to 5 dm. long, shorter than, equalling, or often exceeding the slender culms: pistillate spikelets 1 to 4, globose or ovoid, loosely flowered, approximate or more or less remote, the lowest rarely peduncled, often subtended by a narrow leafy bract: scales usually maroon or red-tinged, rarely pale: perigynia from subglobose to obovoid, puberulent, the short bifid beak one-fourth to one-fifth as long as the body: staminate spikelet clavate, 1 to 2 cm. long, sessile or short-stalked, usually reddish, rarely straw-colored. — In dry or sandy soil from Cumberland Co., MAINE, to ALBERTA, south to GEORGIA and NEW MEXICO. It is impossible to say from the original description whether this or the following variety was intended by Lamarck, but the commonest form of the species has been accepted as typical since it was so considered by Boott, Kunze, and other classic writers on the genus. The varieties and forms described by Peck (46 Rep. N. Y. Mus. Nat. Hist. 51; 48 Rep. 76) appear to be vegetative states due largely to different degrees of light and exposure.

Var. **lucorum**. Perigynium puberulent or glabrate, with a conspicuous slender beak nearly or quite as long as the body. — *C. lucorum*, Willd. Enum. Pl. Berol. Suppl. 63; Kunze, Car. 153, t. 39; Boott, Ill. ii. 98, t. 291, in part. — MAINE to MICHIGAN and "ARCTIC AMERICA," and in the mountains to NORTH CAROLINA. MAINE, Orono, May 31, 1890, June 4, 1898 (no. 2006) — *M. L. Fernald;* Cambridge (*F. S. Bunker*); Glassface Mt., Rumford, July 13, 1890 (*J. C. Parlin*): NEW HAMPSHIRE, Barrett Mt., New Ipswich, June 5, 1896 (*M. L. Fernald*): VERMONT, Chipman Hill, Middlebury, May 30, 1897, Burlington, June 16, 1898 (*E. Brainerd*); Pownal, May 29, 1898 (*J. R. Churchill*): MASSACHUSETTS, Spot Pond, Stoneham, May 29, 1855, Malden, June 11, 1861, Medford, May 21, 1865, Blue Hills, Milton, June 3, 1870 (*Wm. Boott*); Purgatory Swamp, Dedham, May 26, 1878 (*E. & C. E. Faxon*); Wilmington, May 14, 1899 (*E. F. Williams*):

RHODE ISLAND, Cumberland (*S. T. Olney*): CONNECTICUT, Southington, June 4, 1899 (*C. H. Bissell*); Fairfield, June 23, 1901 (*E. H. Eames*, no. 168): MICHIGAN, Detroit, May 22, 1864, June, 1860, May 9, 1858 (*Wm. Boott*): VIRGINIA, Harper's Ferry, May 7, 1881 (*John Donnell Smith*): NORTH CAROLINA, Broad River, May, 1841 (*Rugel* according to Kunze, l. c.). The long slender beak of the perigynium and its essentially northern and montane range suggest that further knowledge of the plant may show it to be well distinguished from *C. pennsylvanica*. No other character has yet been found by which it can be recognized, and occasional individuals show transitions in the elongation of the beak.

Var. VESPERTINA, Bailey, Mem. Torr. Cl. i. 74. Rather coarser than the species: the usually very dark staminate spikelet peduncled: perigynia more coarsely hairy, almost hirsute. — The northwestern form, from the Cascade Mts. of BRITISH COLUMBIA to OREGON and VANCOUVER ISLAND.

CAREX UMBELLATA.

Like *C. pilulifera* and *C. pennsylvanica*, *C. umbellata*, Schkuhr, presents considerable variation in the length and breadth of its leaves and in the length of its culms and peduncles. As in those species, likewise, these purely vegetative characteristics in *C. umbellata* seem to accompany no fixed characteristic of the perigynia, nor any special geographic areas; and too often the long-peduncled spikelets of the so-called var. *vicina* may be found on portions of a clump which is otherwise good *C. umbellata*. As in the related species just discussed, however, *C. umbellata* presents at least two geographic tendencies seemingly characterized by constant differences in the perigynia. A third form, of which we as yet know too little, has the perigynia glabrous, thus breaking through one of the distinguishing marks of the *Montanae*.

Carex umbellata is related on the one hand to *C. nigro-marginata*, and on the other to *C. deflexa*. From these two it is usually distinguished without difficulty, but occasional specimens occur which are perplexing. The writer has found that in such cases the best means of distinction between *C. umbellata* and *C. nigro-marginata* is offered by the thickness of the perigynia. In *C. nigro-marginata* the mature perigynia vary from 1.3 to 1.6 mm. in thickness, while in mature *C. umbellata* they are from 1.7 to 2.4 mm. thick. From doubtful forms of *C. deflexa*, *C. umbellata* may best be distinguished by an examination of the scales. In *C. umbellata* the scales are nearly or quite as long as the subtended perigynia, while in *C. deflexa* they are distinctly shorter.

The most marked tendencies of *C. umbellata* are

C. UMBELLATA, Schkuhr, Riedgr. Nachtr. 75, t. Www, fig. 171 (*C. umbellata*, var. *vicina*, Dewey, Am. Jour. Sci. xi. 317 & x. t. D, fig. 13). Low and conspicuously caespitose, forming dense mats: leaves rather stiff, 0.5 to 4.5 dm. long, 1 to 4.5 mm. wide: culms mostly very short and crowded at the base of the leaves, or some elongated, rarely even to 2 dm., and bearing both staminate and pistillate, or staminate spikelets alone: pistillate spikelets 1 to 4, ovoid or oblong, 0.5 to 1 cm. long, sessile or on short or occasionally elongate-capillary peduncles: perigynia plump, stipitate or substipitate, puberulent, 3.2 to 4.7 mm. long; the slender beak nearly or quite as long as the ellipsoid-ovoid to subglobose or pyriform body, and about equalled by the ovate acuminate green or purple-tinged scale: staminate spikelets subsessile or peduncled, 6 to 12 mm. long. — Dry sandy or rocky places, PRINCE EDWARD ISLAND to central MAINE, west to SASKATCHEWAN and BRITISH COLUMBIA, and south to NEW JERSEY, DISTRICT OF COLUMBIA, and INDIAN TERRITORY.

Var. **tonsa**. Similar, but with the perigynia glabrous or merely puberulent on the angles of the long beak. — MAINE, Streaked Mt., Hebron, June 2, 1897 (*J. A. Allen*): CONNECTICUT, rocky wooded slope of Lantern Hill, North Stonington, May 30, 1901 (*C. B. Graves*). A plant with identical glabrous perigynia is figured in Boott, Ill. ii. t. 293, from specimens collected at Methy Portage, ATHABASCA, by *Sir John Richardson*. This and the New England plant represent a tendency unusual in the *Montanae*.

Var. BREVIROSTRIS, Boott, Ill. ii. 99, t. 294. Perigynia rather smaller, the broad beak short, about one-third as long as the plump short-hairy body. — The commonest form from SASKATCHEWAN to VANCOUVER ISLAND, south in the mountains to CALIFORNIA and NEW MEXICO: also MAINE, Fort Kent, Ashland, Masardis, Island Falls and Foxcroft (*M. L. Fernald*, nos. 2111, 2112, 2113, 2114, 2115); summit of Sargent Mt., Mount Desert Island (*E. & C. E. Faxon*): NEW HAMPSHIRE, Mt. Willard, and Bald Mt., Franconia (*E. & C. E. Faxon*).

CAREX VAGINATA and C. SALTUENSIS.

C. VAGINATA, Tausch, Flora (1821) 557 (*C. vaginata*, var. *alto-caulis*, Dewey, Am. Jour. Sci., Ser. 2, xli. 227. *C. saltuensis*, Bailey, Mem. Torr. Cl. i. 7. *C. altocaulis*, Britton, in Britton & Brown, Ill. Fl. i. 326, fig. 773). The American plant was long considered by Francis Boott and other caricologists identical with the European; but in 1866 the New York plant was distinguished by Dewey, on account of its tall slender culm, narrow leaves and loose spikelets as var. *alto-caulis*. In 1889, however, Professor Bailey raised the American plant to specific rank as *C. saltuensis*, separating it from the European *C. vaginata* "by its much more slender and less caespitose habit, narrower leaves and less conspicuous sheaths, its alternately-flowered spikes, and its much smaller, less inflated, and conspicuously nerved perigynium." And Dr. Britton, following Professor Bailey's lead in treating the plant as strictly American, has taken up for it Dewey's varietal name as *altocaulis* (not *alto-caulis*).

That American specimens from the deep swamps of western New York, Ontario and Michigan are more slender than some European specimens there can be no doubt; but in northeastern Maine, where the plant is a common species of arbor-vitae swamps, it varies greatly in these characters. Individuals growing in excessive shade are naturally taller and more slender than those in bright light; and the spikelets vary indiscriminately from the slender alternate-flowered tendency supposed to characterize the American plant to the dense-cylindric form said to distinguish the European.

The height of the European plant, too, is often as great as that of the American, while our own plant sometimes fruits when scarcely 2 dm. high (Mt. Albert, Quebec — *Allen;* Blaine, Maine — *Fernald*). A specimen from Christiania collected by Blytt is 5 dm. high, while the extreme height given by Dr. Britton for his *C. altocaulis* is 2 feet (6 dm.).

The breadth of the leaf, likewise, is as variable on one continent as on the other. Both Dewey and Bailey have maintained that the European plant is broader-leaved; yet a specimen from Fries collected in Jemtland (Sweden) has leaves from 1.5 to 1.75 mm. wide, while the broadest leaves seen on the European plant are those of a Lapland specimen (5 mm. wide) from N. J. Andersson. In the American plant the leaves vary from 1.5 mm. wide (Blaine, Maine) to 5 mm. (Montreal).

The variation in the density of the spikelet in the American plant has been already mentioned. In Europe the same variation occurs, specimens from Jemtland (*Ahlberg*), Lapland (*Andersson*) and Finland (*Lehmann*) having the spikelets as loosely flowered as in the most extreme American form.

Nor are the differences assigned by Professor Bailey to the perigynia maintained in mature specimens. Young individuals of the American as well as the European plant have the nerves poorly developed, but in mature fruit no difference is apparent between plants from Christiania, Norway, and Aroostook Co., Maine.

The sheath, said by Professor Bailey to be "less conspicuous" in the American plant, is 4 cm. long, by 2.7 mm. wide in one of Macrae's Montreal specimens, fully as conspicuous as in the best developed European material. There is, then, no reason why the American *Carex saltuensis*, Bailey (*C. altocaulis*, Britton) with no constant vegetative or morphological character and with a broad range from northern Labrador to the Mackenzie River, northern New England, New York, the Great Lakes and the upper Rocky Mts., should be treated as distinct from *C. vaginata* of Greenland, northern Europe and Asia.

CAREX CAPILLARIS.

C. CAPILLARIS, L. Sp. 977. The Linnaean plant was the low plant of the Scandinavian mountains, described as a span high. This plant, well represented in the Gray Herbarium by European specimens from Andersson, Holmgren, Hoppe, Lehmann, Tuckerman, and others, varies in height from 3 to 25 cm., the spikelets being subapproximate or scarcely remote, the lower at most 2 cm. apart. This dwarf plant occurs likewise in Greenland and northeastern Asia. It has been examined from the following regions in America — LABRADOR, Dead Islands (*J. A. Allen*): NEWFOUNDLAND, without locality (*La Pylaie*); Middle Arm, Bay of Islands (*A. C. Waghorne*): QUEBEC, dry stony ground, near summit — 1,150 m. — Mt. Albert (*J. A. Allen*): MAINE, Mt. Kineo (*T. C. Porter et al*): NEW HAMPSHIRE, Mt. Washington (*Wm. Oakes et al*): COLORADO, Rocky Mts., alt. 3,385 m. (*E. L. Greene* in Exsicc. Olney); South Park (*J. Wolfe*, no. 1059); Clear Creek, Georgetown, alt. 2,615 m. (*H. N. Patterson*, no. 144, in part): UTAH (*S. Watson*, no. 1261): WYOMING, La Plata Mines (*E. Nelson*, no. 5260).

Var. ELONGATA, Olney, in herb. & in Rothr. Prelim. Rep. Wheeler Pl. 53 (as *nomen nudum*). Tall, 2 to 6 dm. high, forming loose stools: pistillate spikelets remote, often 6 or 8 cm. apart. — Mossy woods and sphagnum-swamps. RUPERT LAND, Lake Mistassini (*J. M. Macoun*): NEWFOUNDLAND, Coal River, Bay of Islands (*A. C. Waghorne*, no. 24): QUEBEC, Ste. Anne des Monts and Little Metis (*J. A. Allen*): NEW BRUNSWICK, Drury's Cove, St. John (*Wm. Boott*): MAINE, Fort Fairfield (nos. 140, 2029), Blaine (no. 2028), Mars Hill — *M. L. Fernald*: NEW YORK, Otter Creek, near Cortland (*S. N. Cowles*):

Ontario, Bruce Co. (*J. Macoun*): Michigan, Point de Tour (*Wm. Boott*); Port Huron (*C. K. Dodge*): Saskatchewan (*Bourgeau*): Assiniboia, Assiniboine River (*J. Macoun*): Alberta, Bow River (*J. Macoun*): Colorado, Rocky Mts., alt. 2460 m. (*E. L. Greene* in Exsicc. Olney); Twin Lakes (*J. Wolfe*, no. 1060 [type]); Clear Creek (*Parry*, no. 386, *Patterson*, no. 144, in part): Utah, Aquarius Plateau (*L. F. Ward*, no. 484): Idaho, Lake Pend d'Oreille (*Sandberg*, *MacDougal & Heller*, no. 751). A plant confined in the East to arbor-vitae swamps at low altitudes, and in its tall lax habit and very distant spikelets hardly suggesting the dwarf alpine *C. capillaris* with approximate spikelets. Somewhat similar specimens in the Gray Herbarium from Salzburg, Austria, suggest that the same form may be present in Europe.

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EXPLANATION OF PLATES.[1]

PLATE I.

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C. albolutescens: Figs. 22, 23, spikes; Fig. 24, perigynium.

PLATE II.

C. mirabilis: Fig. 25, spike; Fig. 26, perigynium.
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C. tenera, var. *invisa:* Figs. 35, 36, spikes.
C. Bicknellii: Figs. 37, 38, spikes; Figs. 39, 40, perigynia.
C. silicea: Fig. 41, spike; Fig. 42, perigynium.
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PLATE III.

C. festucacea: Fig. 47, spike; Fig. 48, perigynium.
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C. Bebbii: Fig. 52, spike; Fig. 53, perigynium.
C. foenea: Fig. 54, spike; Fig. 55, perigynium.
C. foenea, var. *perplexa:* Fig. 56, spike; Fig. 57, perigynium.

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[1] The plates illustrating this synopsis were prepared by Mr. F. Schuyler Mathews from characteristic specimens. The figures of the spikes represent life-sized individuals, while those showing the *inner* faces of the perigynia are four times as large as in nature.

C. leporina: Figs 58, 59, spikes; Fig. 60, perigynium.
C. xerantica: Fig. 61, spike; Fig. 62, perigynium.
C. aenea: Figs. 63, 64, spikes; Figs. 65, 66, perigynia.
C. adusta: Fig. 67, spike; Figs. 68, 69, perigynia.
C. sychnocephala: Fig. 70, spike; Fig. 71, perigynium.

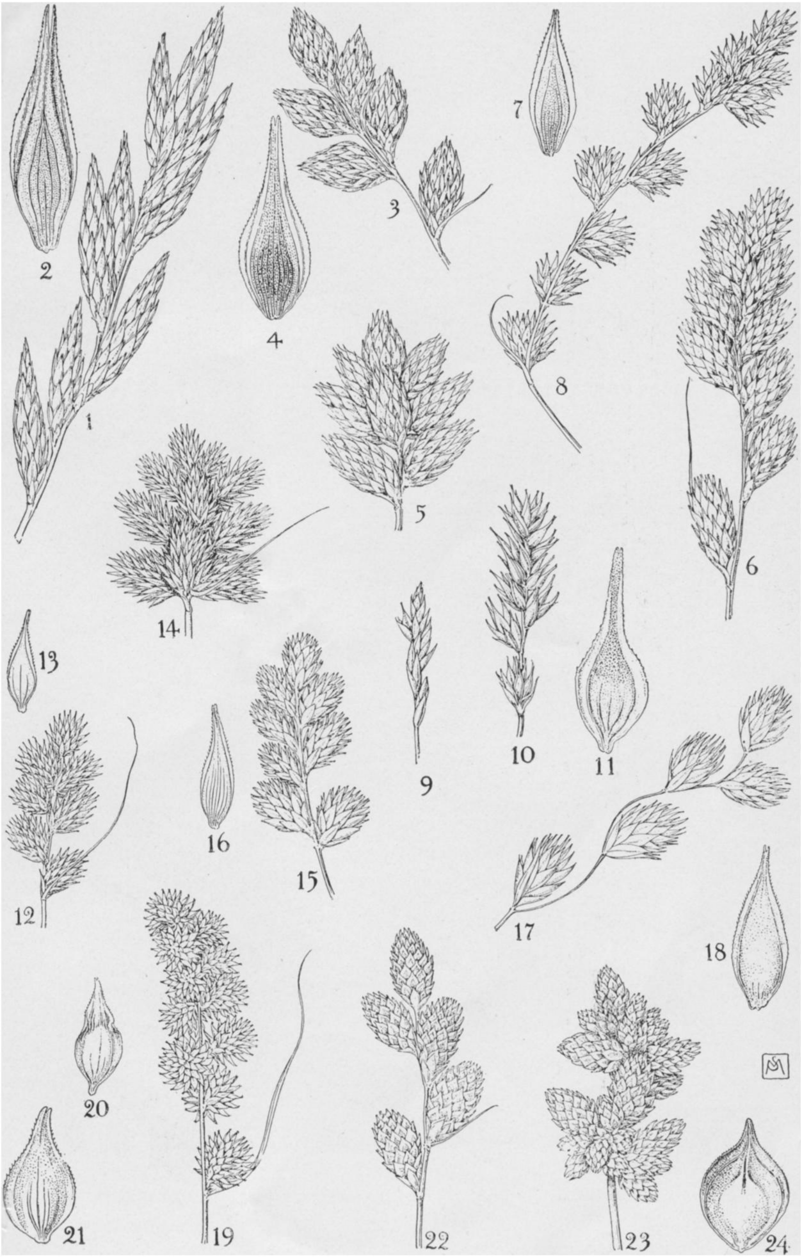
PLATE IV.

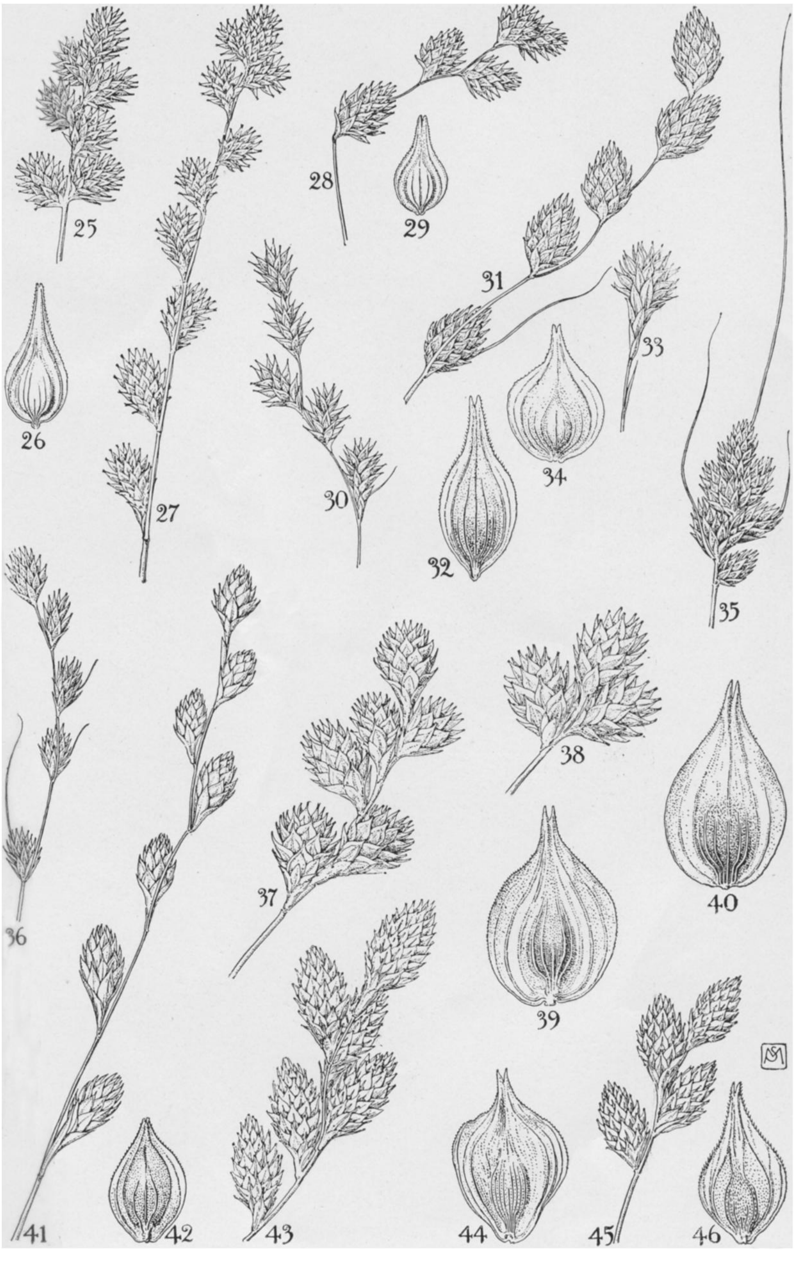
C. gynocrates: Figs. 72, 73, 74, 75, spikes; Figs. 76, 77, perigynia.
C. exilis: Figs. 78, 79, 80, 81, 82, spikes; Fig. 83, perigynium.
C. echinata: Figs. 84, 85, 86, 87, spikes; Fig. 88, perigynium.
C. echinata, var. *ormantha:* Fig. 89, spike.
C. echinata, var. *excelsior:* Figs. 90, 91, spikes.
C. echinata, var. *cephalantha:* Figs. 92, 93, spikes; Fig. 94, perigynium.
C. echinata, var. *angustata:* Figs. 95, 96, spikes; Fig. 97, perigynium.
C. sterilis: Figs. 98, 99, spikes; Fig. 100, perigynium.
C. interior: Figs. 101, 102, 103, spikes; Figs. 104, 105, perigynia.
C. seorsa: Figs. 106, 107, spikes; Figs. 108, 109, perigynia.

PLATE V.

C. arcta. Figs. 110, 111, 112, spikes; Fig. 113, perigynium.
C. canescens: Fig. 114, spike; Fig. 115, perigynium.
C. canescens, var. *subloliacea:* Fig. 116, spike; Fig. 117, perigynium.
C. canescens, var. *disjuncta:* Figs. 118, 119, spikes; Fig. 120, perigynium.
C. brunnescens: Figs. 121, 122, spikes; Fig. 123, 124, perigynia.
C. bromoides: Fig. 125, spike; Fig. 126, perigynium.
C. Deweyana: Fig. 127, spike; Fig. 128, perigynium.
C. tenuiflora: Fig. 129, spike; Fig. 130, perigynium.
C. trisperma: Fig. 131, spike; Fig. 132, perigynium.
C. elachycarpa: Fig. 133, spike; Fig. 134, perigynium.
C. norvegica: Fig. 135, spike; Fig. 136, perigynium.
C. glareosa: Fig. 137, spike; Fig. 138, perigynium.
C. lagopina: Fig, 139, spike; Fig. 140, perigynium.
C. heleonastes: Fig. 141, spike; Fig. 142, perigynium.

Fernald — Carex § Hyparrhenae. Plate I.

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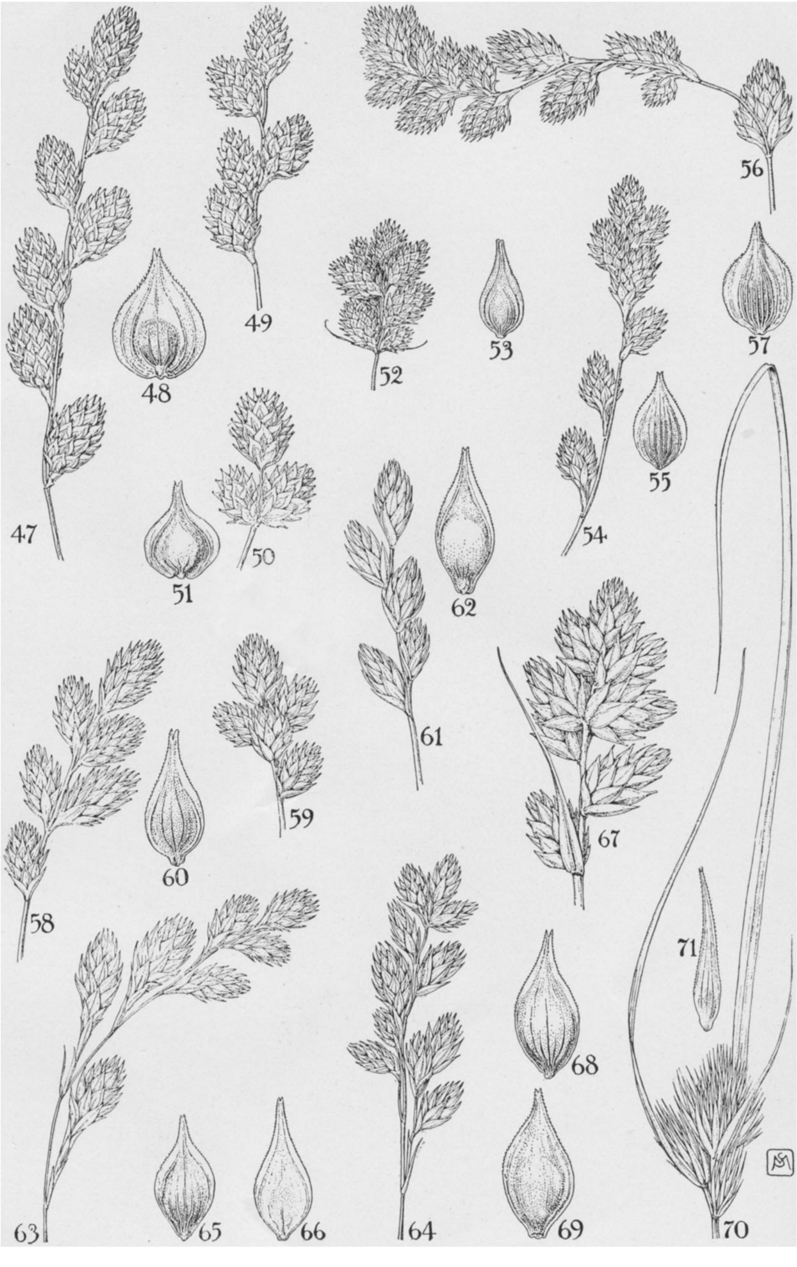
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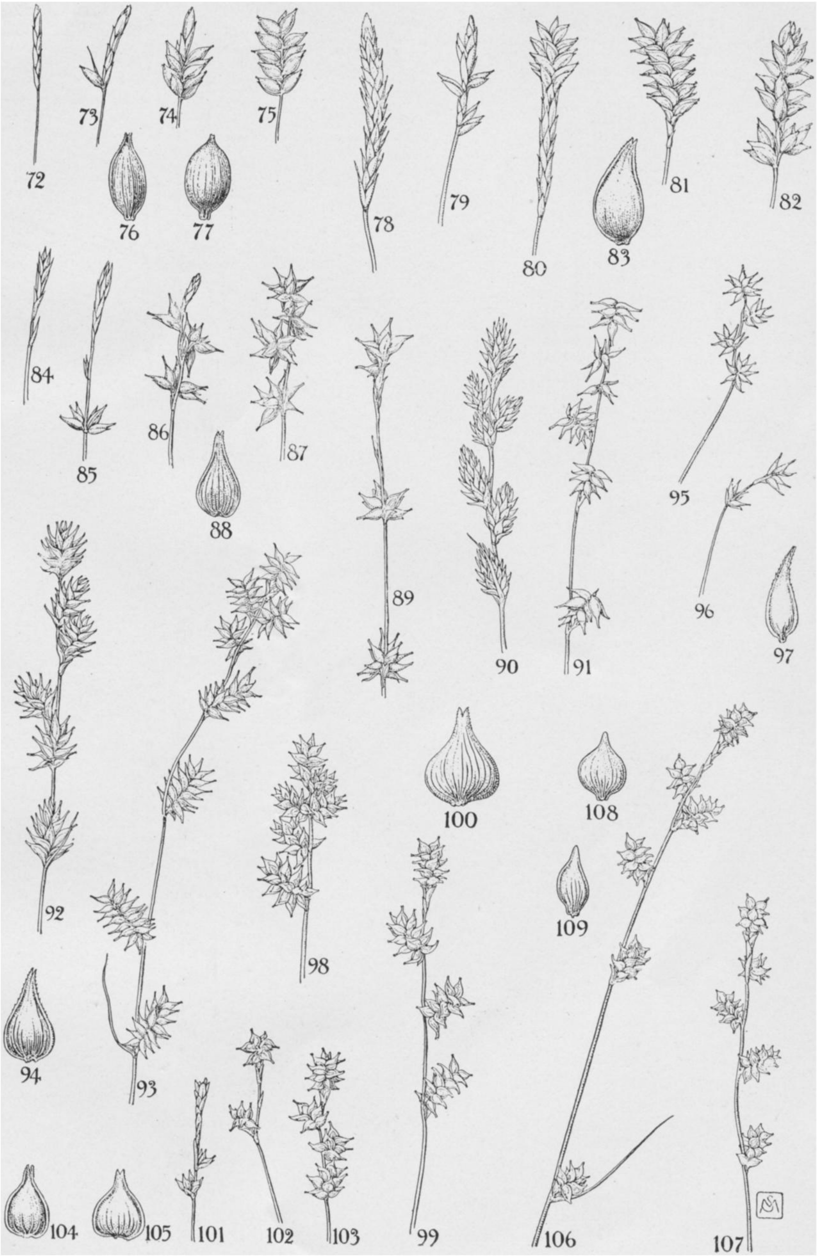
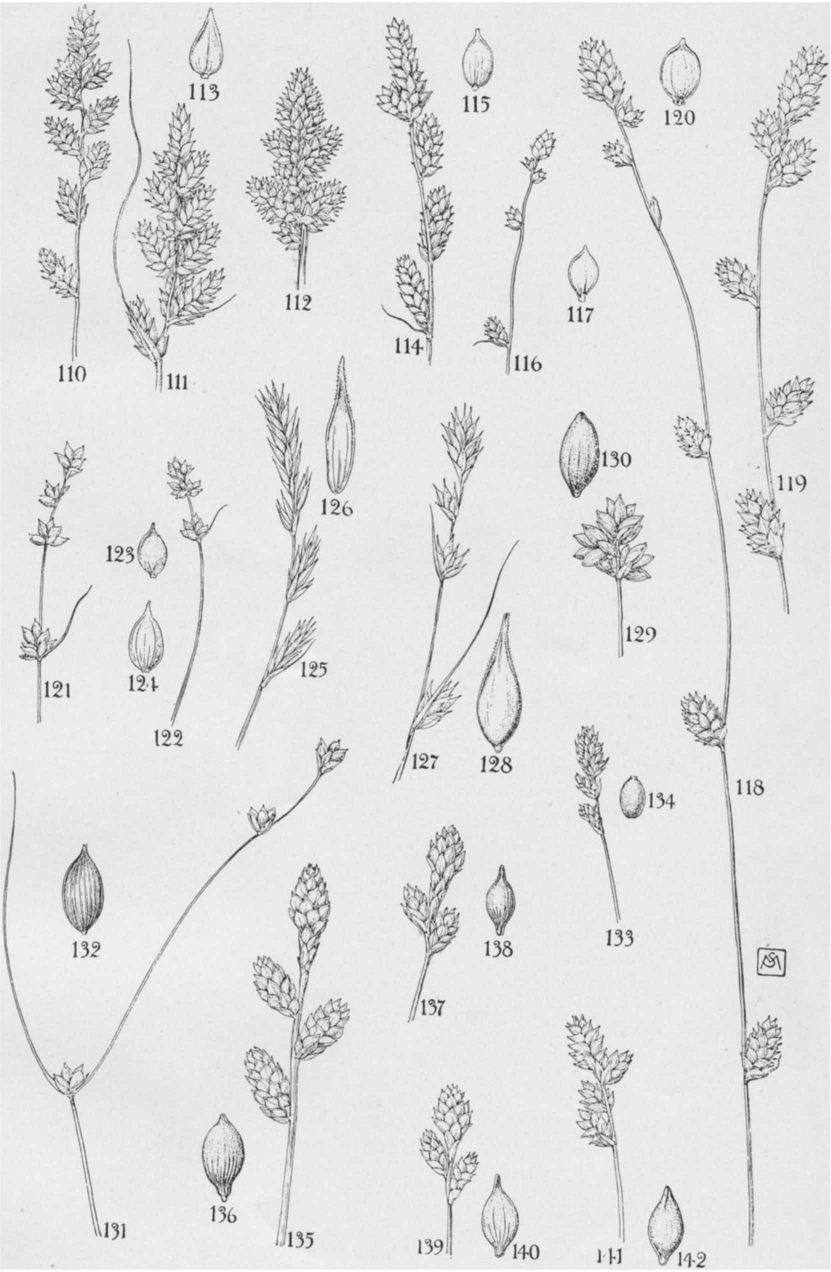
Plate IV.

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